



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,470	03/31/2004	Jihperng Leu	110348-135997	8408

31817 7590 05/27/2005

SCHWABE, WILLIAMSON & WYATT
PACWEST CENTER, SUITES 1600-1900
1211 S.W. FIFTH AVE.
PORTLAND, OR 97204

EXAMINER

HO, TU TU V

ART UNIT	PAPER NUMBER
----------	--------------

2818

DATE MAILED: 05/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/816,470	Applicant(s) LEU ET AL.	
	Examiner Tu-Tu Ho	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 19-24 is/are rejected.
- 7) ☒ Claim(s) 15-18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 08/09/2004 is acceptable.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1-5, 7-10, and 13** are rejected under 35 U.S.C. 102(e) as being anticipated by
Ong U.S. Patent Application Publication 20040104481 (the '481 reference).

The '481 reference discloses in the figures, particularly Fig. 8, and respective portions of the specification a die and a method thereof as claimed.

Referring to **claims 1 and 9**, the reference discloses a die and method thereof,
comprising:

an insulation layer (102, "interlevel dielectric", paragraph [0033]); and

an interconnect (108) in the insulation layer, the interconnect having been formed with its grain structure adapted to reduce electron scattering ("improving the electromigration", paragraph [0032], and paragraph [0012] for an explanation of the art-equivalent of

electromigration and electron scattering; and if evidence is still required, PGPUB-DOCUMENT-NUMBER: 20040180531 by Horikoshi, paragraph [0044] for the art-equivalency of electromigration and electron scattering).

Referring to **claim 2**, the reference further discloses that the interconnect is adapted to have a bamboo grain structure (paragraph [0032]).

Referring to **claims 3 and 7-8**, the limitations of “localized annealing employing laser annealing” and “localized annealing employing resistive annealing” are considered non-limitation in a device claim as the limitations does not result in a structural difference.

Referring to **claim 10**, the reference further discloses that the method further comprises localized annealing employing laser annealing (paragraph [0039]).

Referring to **claims 4 and 13**, the reference’s material list for the interconnect (paragraph 0037]) meets the limitation of the claimed Markush group.

Referring to **claim 5**, the reference further discloses that the die further comprises a diffusion barrier layer (such as element 106, paragraph [0034]).

3. Claims 1-2, 4, 5, 9, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Nogami et al. U.S. Patent 6,417,571 (the ‘571 reference).

The ‘571 reference discloses a structure and method thereof comprising an insulation layer (102, Fig. 4A), an interconnect (106) in the insulation layer, the interconnect having been formed with its grain structure adapted to reduce electron scattering (column 3, lines 60+, and see note above about the art-equivalency of electromigration and electron scattering), the grain structure having a bamboo grain structure (column 4, lines 37+) meeting the limitations of claim

2, the structure being formed of copper (column 4, line 35), meeting the limitations of the Markush group of claims 4 and 13, and a diffusion barrier layer 104, meeting the limitations of claim 5.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 6, 11-12, 14, and 20-24 are rejected under 35 U.S.C. §103(a) as being unpatentable over Ong U.S. Patent Application Publication 20040104481 (the '481 reference).

Referring to **claims 20 and 24**, the '481 reference discloses a die as claimed and as detailed above for claim 1, but fails to teach that the die could be utilized in a system as claimed. Specifically, the reference fails to teach a system utilizing such die, wherein the system comprises a bus coupled to the die and a networking interface coupled to the bus. However, since the reference also does not preclude such usage and since at the time the invention was made, it was known that systems such as digital cameras and CD players each comprise a die, a bus coupled to the die and a networking interface coupled to the bus, such usage would be within the skill of an ordinary artisan and therefore would have been obvious.

Referring to **claim 21**, as detailed above, the reference further discloses that the interconnect is adapted to have a bamboo grain structure.

Referring to **claims 22-23**, the limitations of “localized annealing employing laser annealing” and “localized annealing employing resistive annealing” are considered non-limitation in a device claim as the limitations does not result in a structural difference.

Referring to **claims 11-12**, the ‘481 reference discloses a method as claimed and as detailed above for claim 9 including using a laser source for annealing, but fails to teach using specific laser sources and specific operation data for the laser source as claimed, however, it is within the skill of an ordinary artisan to select from the claimed various laser sources and various operation data for the laser source, therefore the claimed limitations were obvious.

Referring to **claims 6 and 14**, the ‘481 reference discloses a device and method thereof as claimed and as detailed above for claims 1 and 9, including the insulation layer 102. The reference further discloses that the insulation layer 102 is formed of a low-k material (paragraph [0033]). However, the reference fails to disclose that the insulation layer has a thermal budget of less than or equal to about 450 degree Celsius. Nevertheless, it is known that low-k insulation layers should preferably have a thermal budget of less than or equal to about 450 degree Celsius, as is disclosed by Gilbert et al. PGPUB-DOCUMENT-NUMBER: 20020072223, therefore the limitation would have been obvious because such a thermal budget was a preferred budget for low-k insulation layers.

5. **Claim 19** is rejected under 35 U.S.C. §103(a) as being unpatentable over Ong U.S. Patent Application Publication 20040104481 (the ‘481 reference) in view of Seo et al. PGPUB-DOCUMENT-NUMBER: 20040094511.

The '481 reference discloses a method as claimed and as detailed above for claim 9 to form the interconnect, including forming the interconnect by electroplating (paragraph [0036]); but fails to teach the use of a seed layer for the interconnect. Seo, also in disclosing a method for forming an interconnect, teaches that a seed layer facilitates electroplating (paragraph [0003]). Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to form the reference's interconnect with a seed layer. One would have been motivated to make such a change because a seed layer facilitates electroplating the interconnect in forming the interconnect.

Allowable Subject Matter

6. Claims 15 and dependent claims 16-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for the indication of allowable subject matter: The cited art, whether taken singularly or in combination, especially when all limitations are considered within the claimed specific combination, fails to teach or render obvious a method having all limitations as recited in claims 9 and 15, characterized in that the adapting comprises localized annealing of the interconnect by resistive annealing.

Conclusion

Art Unit: 2818

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho
May 11, 2005